United States Patent [19]

Duffield et al.

[11] **Patent Number: 4,959,720**

[45] **Date of Patent: Sep. 25, 1990**

[54] **TUNER CONTROL APPARATUS HAVING TUNE-BY-LABEL CAPABILITY**

[75] Inventors: **David J. Duffield**, Indianapolis; **Billy W. Beyers, Jr.**, Greenfield, both of Ind.

[73] Assignee: **RCA Licensing Corporation**, Princeton, N.J.

[21] Appl. No.: **334,068**

[22] Filed: **Apr. 6, 1989**

[51] **Int. Cl.**[5] **H04N 5/50**; H04N 5/44; H04N 9/74

[52] **U.S. Cl.** **358/191.1**; 358/22; 358/194.1; 340/825.03; 455/186; 455/603

[58] **Field of Search** 358/22, 191.1, 194.1; 340/825.03, 825.29; 455/151, 186, 603

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,123,713	10/1978	Wine	325/455
4,187,469	2/1980	Tanaka	455/186
4,313,213	1/1982	Farina et al.	455/186
4,314,375	2/1982	Belisomi	455/186
4,356,509	10/1982	Skerlos et al.	358/194.1
4,456,925	6/1984	Skerlos et al.	358/194.1
4,644,349	2/1987	Fujita et al.	340/825.25
4,706,121	11/1987	Young	358/142
4,751,578	6/1988	Reiter	358/22

OTHER PUBLICATIONS

Mark Fleischmann, "Bold New Gear", Video Magazine, Apr. 1989, pp. 36–39 and 54–55.

Grundig Service Manual, CUC 2400.

Hitachi VT-S625 User Manual, pp. 18–19.

RCA VPT 595 Videocassette Recorder Owner's Manual, pp. 29–30.

RCA Dimensia Interconnect and Operations Manual, p. 10.

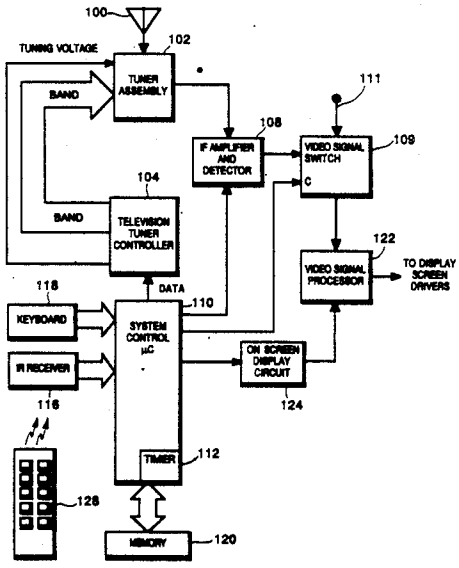
Primary Examiner—John K. Peng

Attorney, Agent, or Firm—Joseph S. Tripoli; Peter M. Emanuel; Thomas F. Lenihan

[57] **ABSTRACT**

A tuning system is provided which allows a user to enter text labels associated with respective channels or television programs to be tuned so that, thereafter, a channel or program to be tuned may be selected by the user by entering its label. Scheduling of television programs by label is also provided by storing time-related data as well as channel-related data and associating these data for each television program with a user-entered label.

8 Claims, 8 Drawing Sheets



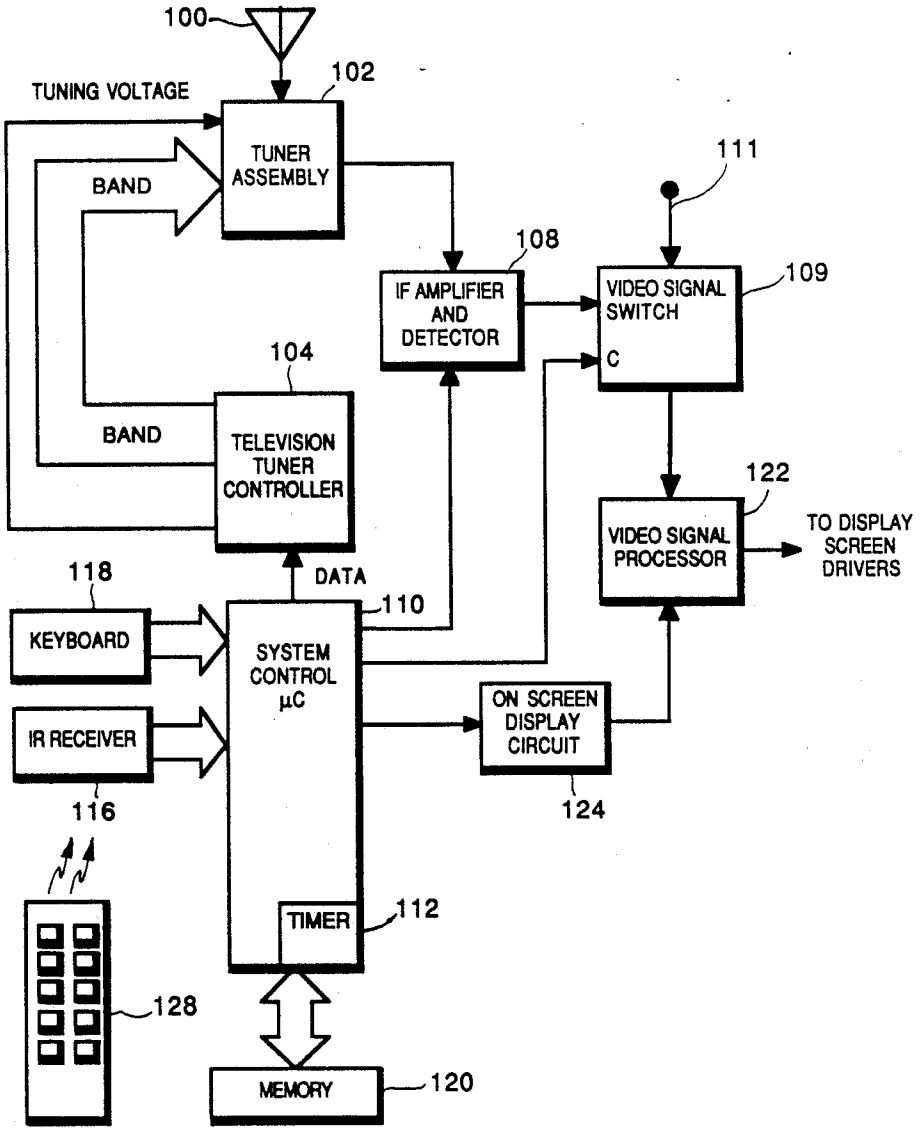
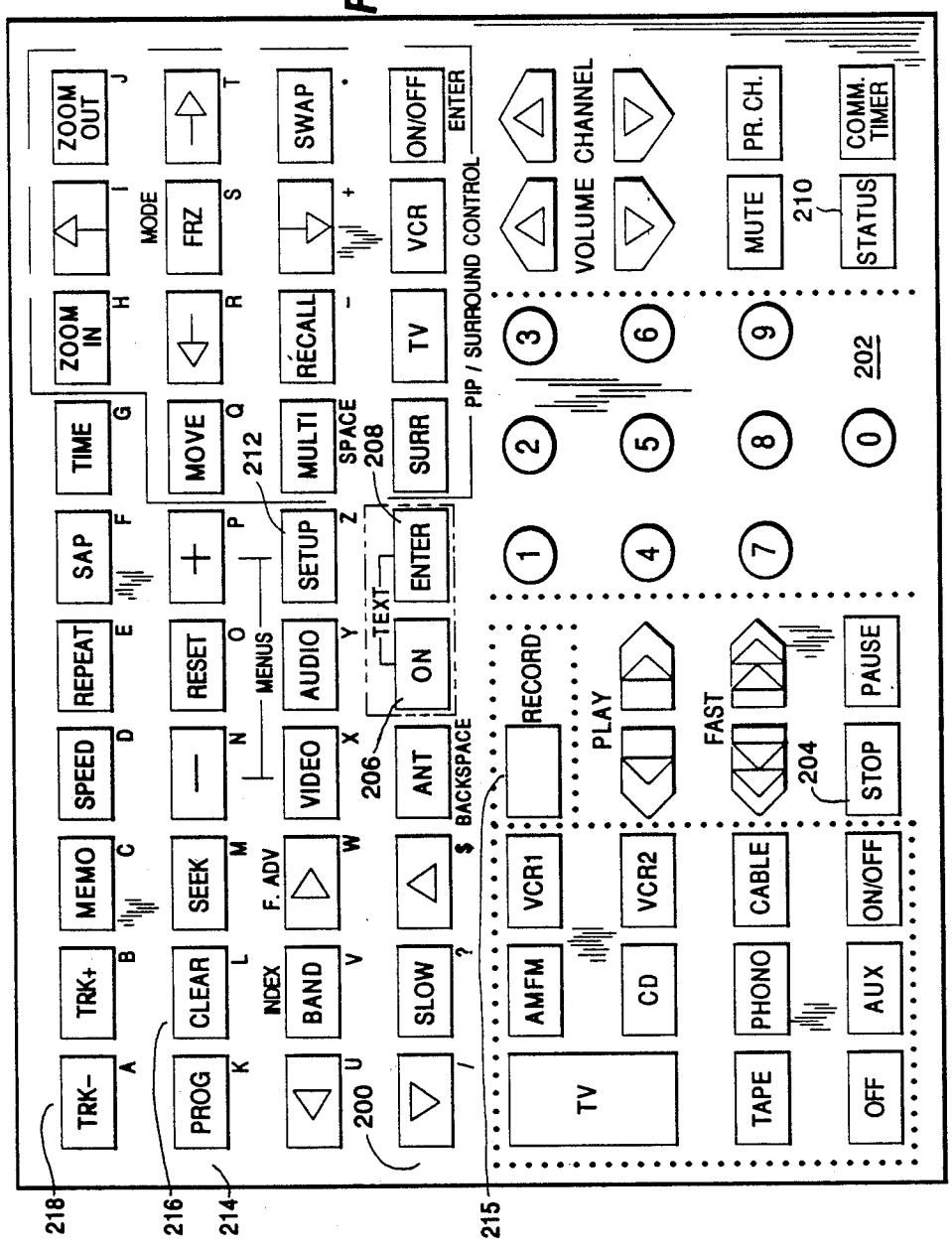

100
102
TUNING VOLTAGE
TUNER ASSEMBLY
BAND
111
108
IF AMPLIFIER AND DETECTOR
VIDEO SIGNAL SWITCH
109
C
104
BAND
TELEVISION TUNER CONTROLLER
122
VIDEO SIGNAL PROCESSOR
TO DISPLAY SCREEN DRIVERS
118
DATA
110
KEYBOARD
SYSTEM CONTROL µC
ON SCREEN DISPLAY CIRCUIT
IR RECEIVER
116
124
TIMER
112
128
MEMORY
120

FIG. 1

FIG. 2


TRK-
TRK+
MEMO
SPEED
REPEAT
SAP
TIME
ZOOM IN
ZOOM OUT
PROG
CLEAR
SEEK
—
RESET
+
MOVE
FRZ
SWAP
BAND
VIDEO
AUDIO
SETUP
MULTI
RECALL
SLOW
ANT
ON
ENTER
SURR
TV
VCR
ON/OFF
TV
AMFM
CD
VCR1
VCR2
RECORD
PLAY
FAST
TAPE
PHONO
CABLE
OFF
AUX
ON/OFF
STOP
PAUSE
MUTE
PR.CH.
STATUS
COMM. TIMER
VOLUME
CHANNEL
MODE
INDEX
F. ADV
MENUS
TEXT
SPACE
BACKSPACE
PIP / SURROUND CONTROL
ENTER
1
2
3
4
5
6
7
8
9
0
202
204
206
208
210
212
214
215
216
218
200

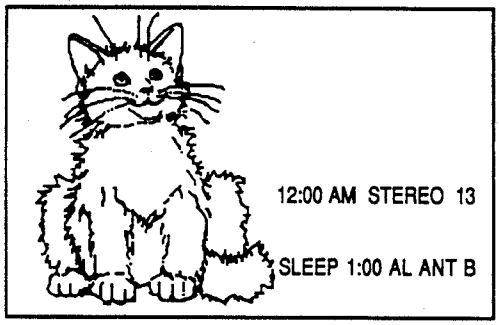


FIG. 3a PRIOR ART

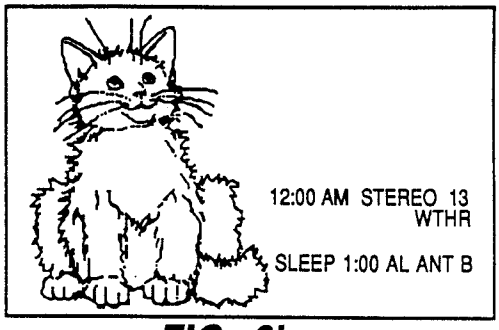


FIG. 3b

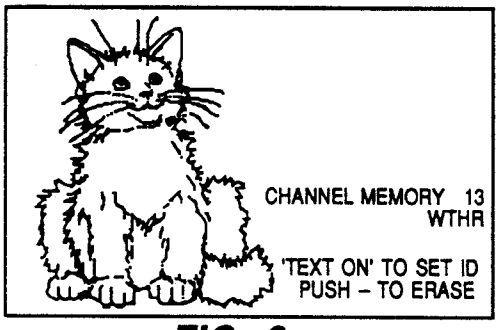


FIG. 3c

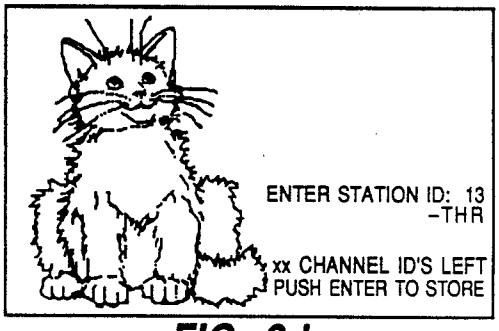


FIG. 3d

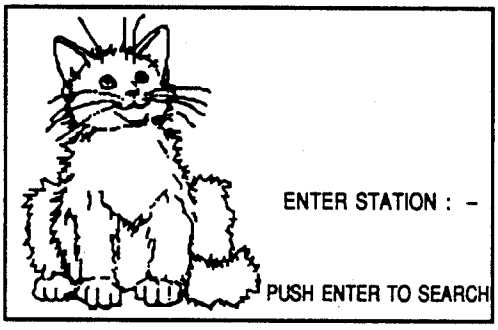


FIG. 3e

FIG. 4

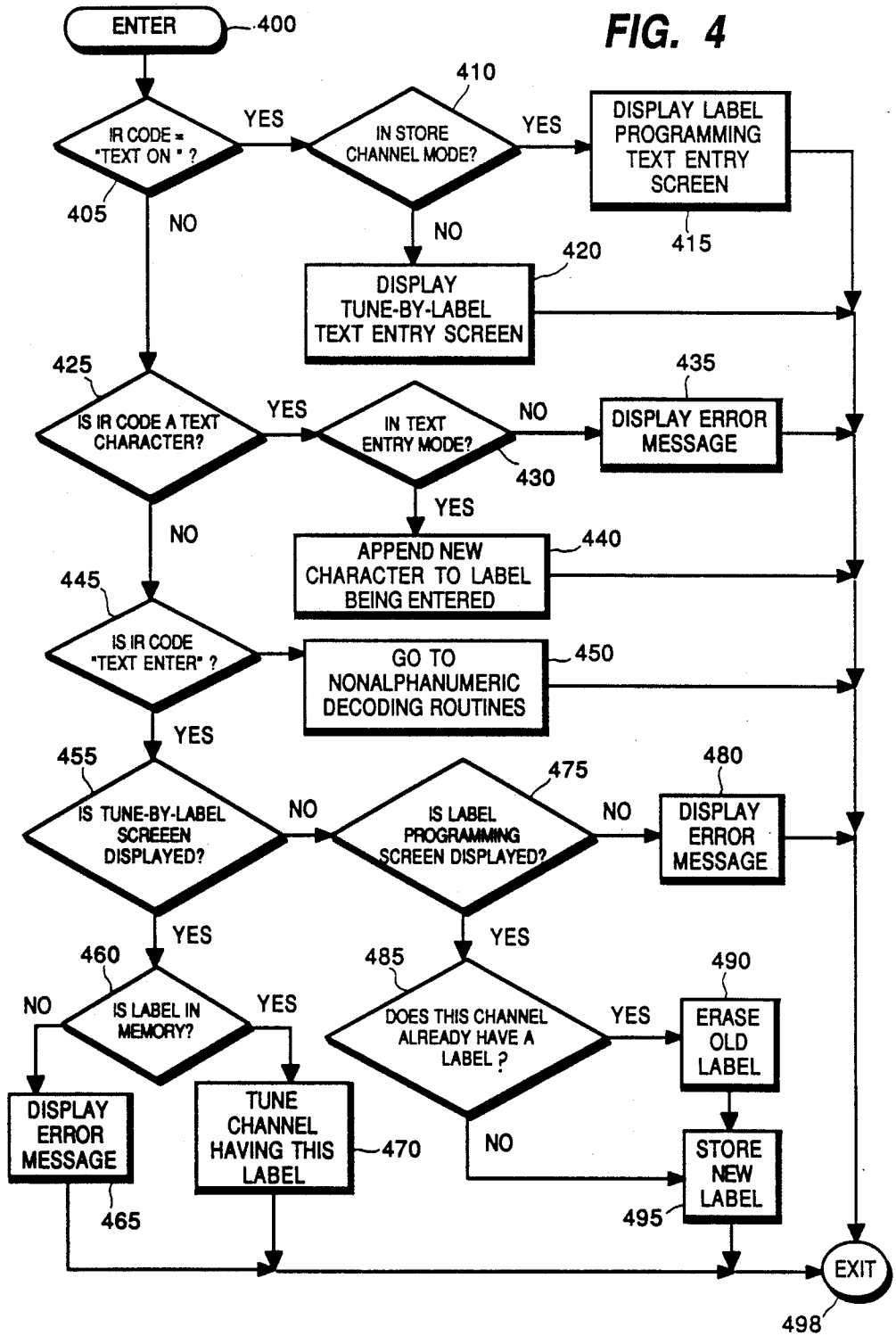

ENTER
400
IR CODE = "TEXT ON" ?
405
YES
NO
IN STORE CHANNEL MODE?
410
YES
NO
DISPLAY LABEL PROGRAMMING TEXT ENTRY SCREEN
415
DISPLAY TUNE-BY-LABEL TEXT ENTRY SCREEN
420
IS IR CODE A TEXT CHARACTER?
425
YES
NO
IN TEXT ENTRY MODE?
430
YES
NO
DISPLAY ERROR MESSAGE
435
APPEND NEW CHARACTER TO LABEL BEING ENTERED
440
IS IR CODE "TEXT ENTER" ?
445
YES
GO TO NONALPHANUMERIC DECODING ROUTINES
450
IS TUNE-BY-LABEL SCREEEN DISPLAYED?
455
NO
YES
IS LABEL PROGRAMMING SCREEN DISPLAYED?
475
NO
YES
DISPLAY ERROR MESSAGE
480
IS LABEL IN MEMORY?
460
NO
YES
DISPLAY ERROR MESSAGE
465
TUNE CHANNEL HAVING THIS LABEL
470
DOES THIS CHANNEL ALREADY HAVE A LABEL ?
485
YES
NO
ERASE OLD LABEL
490
STORE NEW LABEL
495
EXIT
498

FIG. 5a

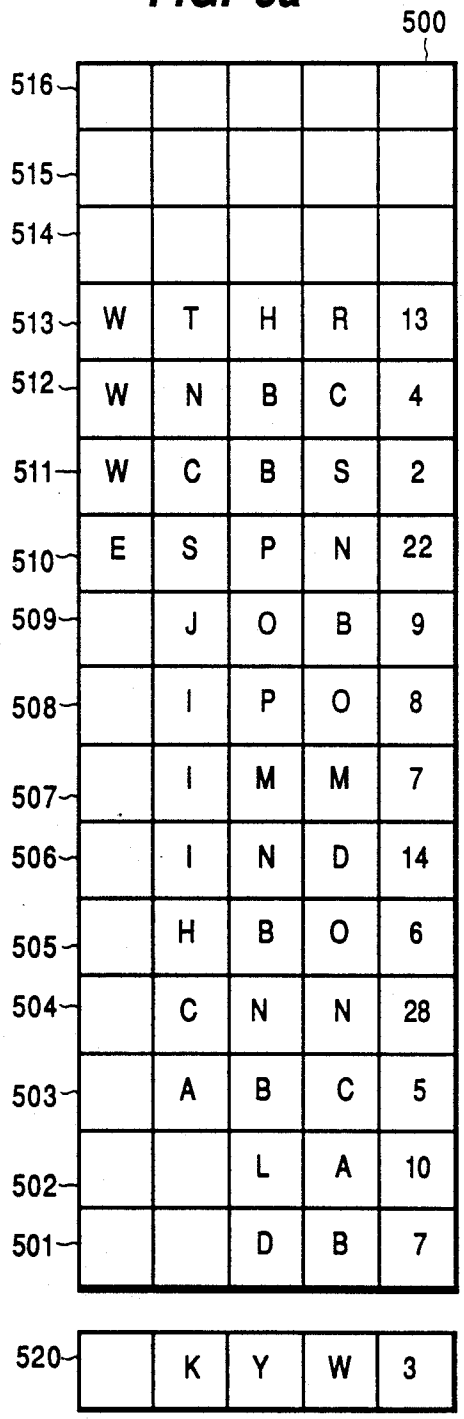

500
516
515
514
513 W T H R 13
512 W N B C 4
511 W C B S 2
510 E S P N 22
509 J O B 9
508 I P O 8
507 I M M 7
506 I N D 14
505 H B O 6
504 C N N 28
503 A B C 5
502 L A 10
501 D B 7
520 K Y W 3

FIG. 5b

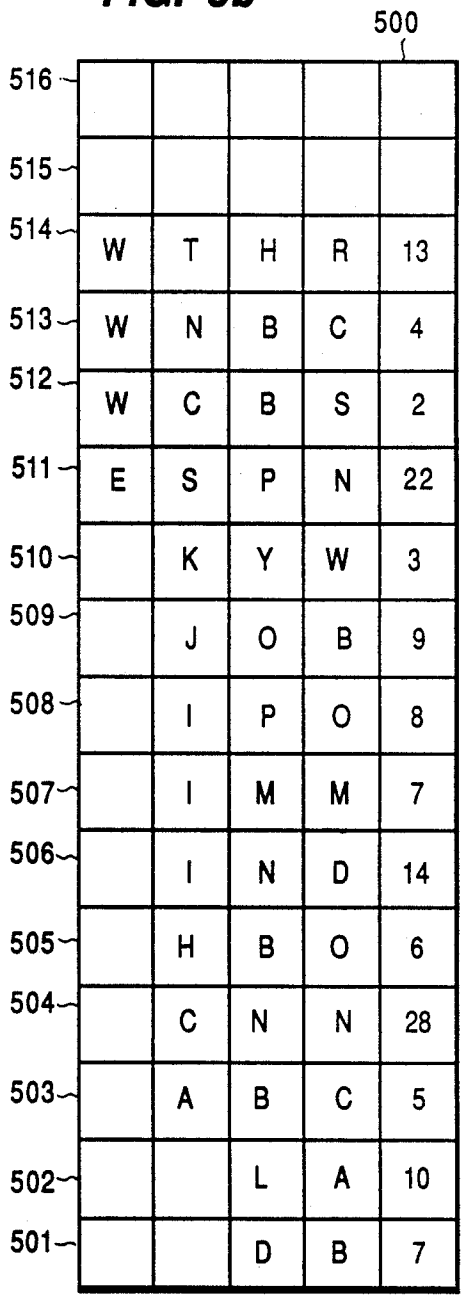

500
516
515
514 W T H R 13
513 W N B C 4
512 W C B S 2
511 E S P N 22
510 K Y W 3
509 J O B 9
508 I P O 8
507 I M M 7
506 I N D 14
505 H B O 6
504 C N N 28
503 A B C 5
502 L A 10
501 D B 7

FIG. 6

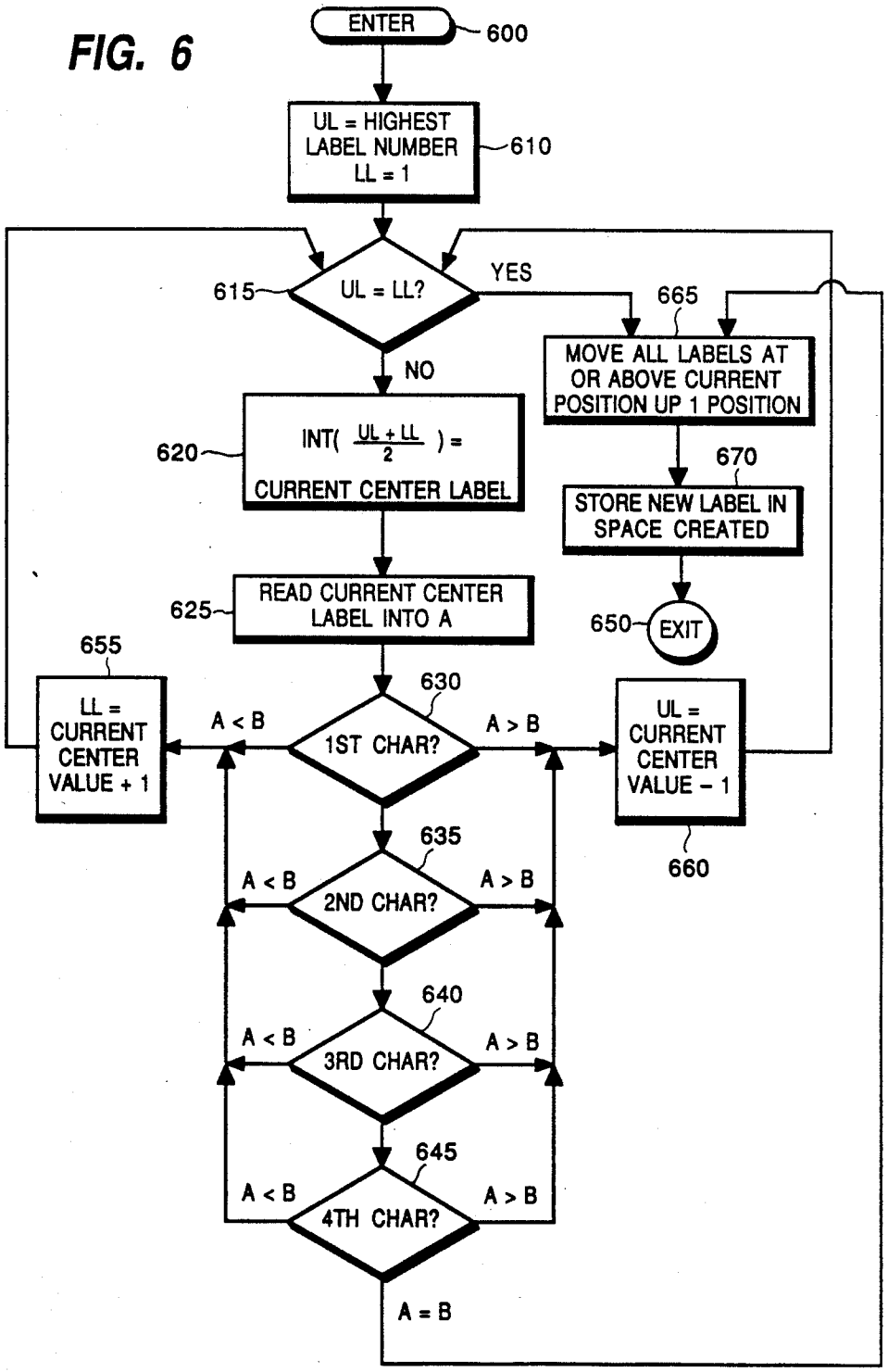

ENTER
600
UL = HIGHEST LABEL NUMBER
LL = 1
610
615
UL = LL?
YES
665
MOVE ALL LABELS AT OR ABOVE CURRENT POSITION UP 1 POSITION
NO
620
INT(UL + LL / 2) = CURRENT CENTER LABEL
670
STORE NEW LABEL IN SPACE CREATED
625
READ CURRENT CENTER LABEL INTO A
650
EXIT
655
LL = CURRENT CENTER VALUE + 1
630
A < B
1ST CHAR?
A > B
UL = CURRENT CENTER VALUE - 1
660
635
A < B
2ND CHAR?
A > B
640
A < B
3RD CHAR?
A > B
645
A < B
4TH CHAR?
A > B
A = B

FIG. 7

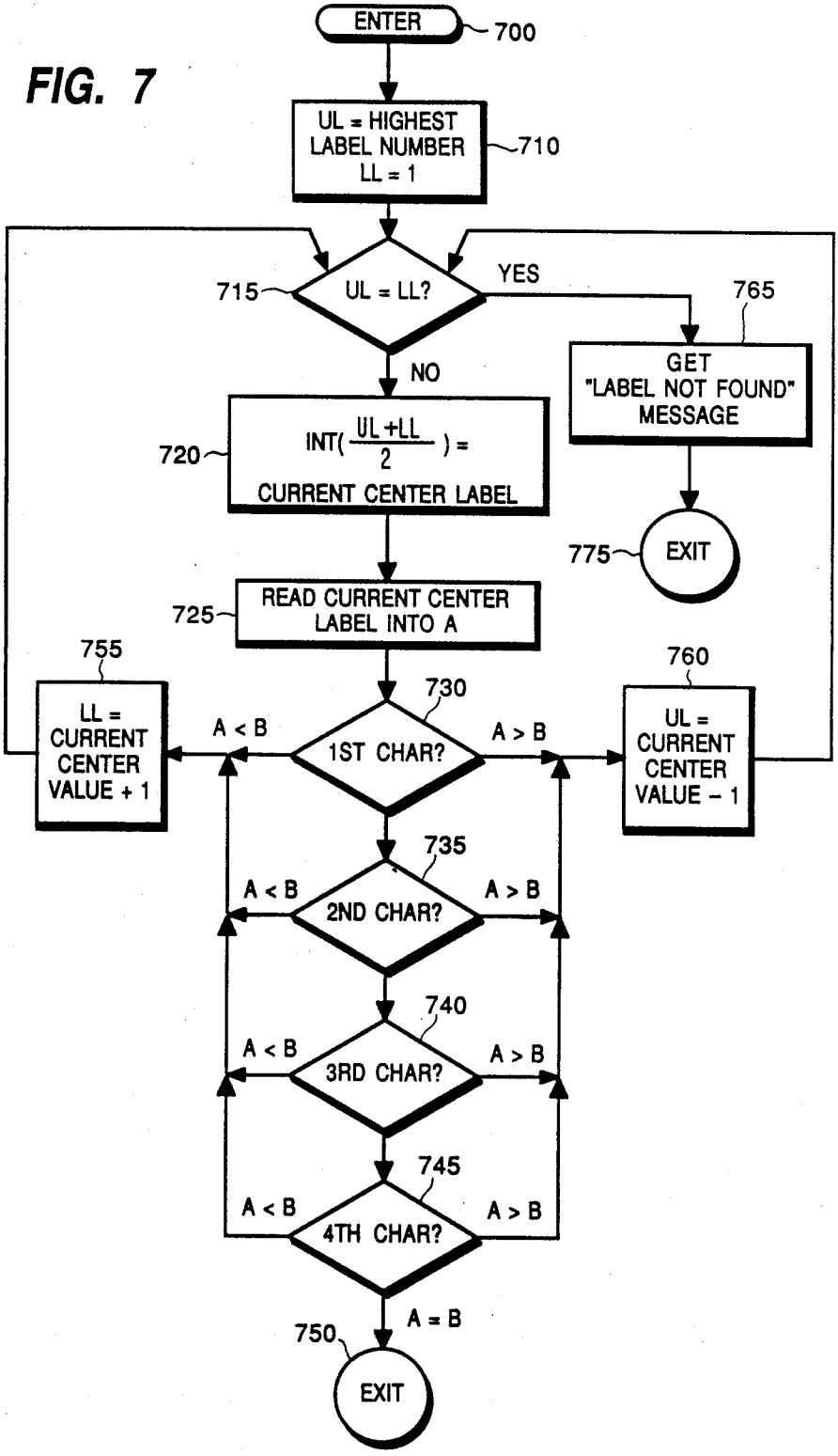

ENTER
700
UL = HIGHEST LABEL NUMBER
LL = 1
710
715
UL = LL?
YES
765
GET "LABEL NOT FOUND" MESSAGE
775
EXIT
NO
720
INT(UL+LL / 2) = CURRENT CENTER LABEL
725
READ CURRENT CENTER LABEL INTO A
755
LL = CURRENT CENTER VALUE + 1
730
1ST CHAR?
A < B
A > B
760
UL = CURRENT CENTER VALUE – 1
735
2ND CHAR?
A < B
A > B
740
3RD CHAR?
A < B
A > B
745
4TH CHAR?
A < B
A > B
A = B
750
EXIT

FIG. 8a

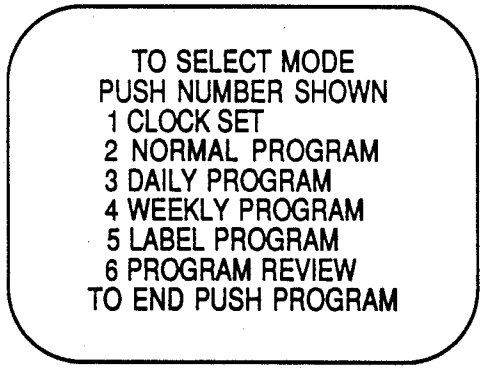


FIG. 8b

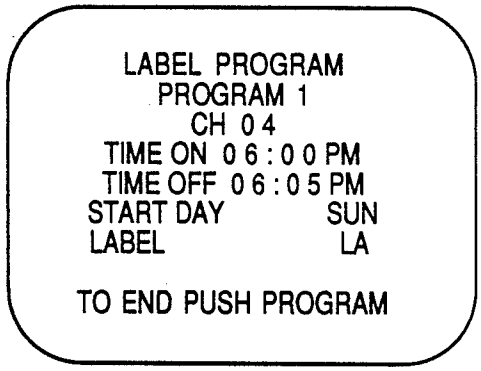


FIG. 8c

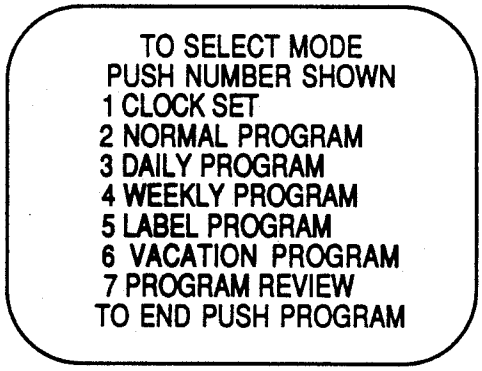
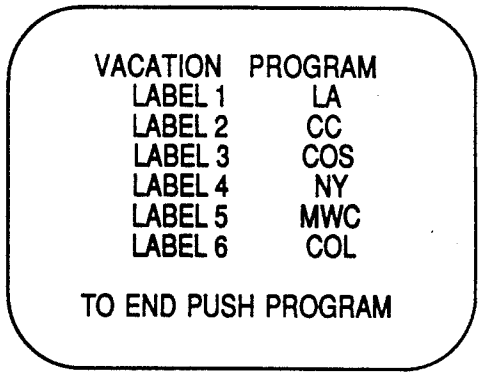


FIG. 8d



TUNER CONTROL APPARATUS HAVING TUNE-BY-LABEL CAPABILITY

FIELD OF THE INVENTION

This invention relates to the field of tuner controls for television receivers (including VCRs) and radios.

CROSS REFERENCE TO RELATED APPLICATIONS

This application is related to an application entitled TUNER CONTROL APPARATUS HAVING TUNE-BY-LABEL CAPABILITY AND USING ALPHABETICAL LABEL STORAGE, filed in the name of David Jay Duffield and assigned to the same assignee as the subject application.

BACKGROUND OF THE INVENTION

In the United States there are at least 3 major broadcasting networks (e.g. ABC, NBC, and CBS), and also a number of cable service networks (e.g. HBO, ESPN, Cinemax, etc.), each of which distributes broadcast television programs throughout the country. Many viewers tend to associate their favorite television programs with the networks that carry them. A common problem is that there are so many channels available that it is difficult for a viewer to remember which channel number corresponds to which network. For example, in some areas of the country a viewer has access to as many as 40 channels. Thus, tuning by channel number, although widely used, may not be desirable in these situations.

Furthermore, in the hotel/motel environment, the visitor is typically unfamiliar with local channel numbers. When the visitor wishes to watch a favorite program on a known major network, he may have difficulty locating the proper local channel owned by, or affiliated with the major network. Compounding this problem is the fact that it is common practice among cable companies in the United States to remodulate broadcast signals to different channels of the RF spectrum than those channels which they normally occupy. Unfortunately, this also has the effect of confusing the viewer because, for instance, UHF channel 29 may be remodulated (down converted) to occupy the frequency space of, for example, VHF channel 9. Thus, even if a viewer happened to know that the FOX Broadcasting Network corresponds to channel 29 (as it does in Philadelphia), the viewer may still have difficulty locating his desired programs when the signals transmitted by channel 29 are in fact received on cable channel 9.

A common solution to this problem is to distribute channel conversion charts to cable subscribers so that they may locate the proper cable channel, given the standard broadcast channel, from a printed television schedule. This solution is less than satisfactory because of the relatively large number of available channels.

Additionally, a problem arises because the channel numbers assigned to the major networks are not the same across the country. For example, the National Broadcasting Company (NBC) broadcasts on channel 4 in New York City, N.Y., on channel 3 in Philadelphia, Pa., on channel 5 in Cincinnati, Ohio, and on channel 11 in Dayton, Ohio. Because television manufacturers cannot know in advance in which viewing areas their receivers will be operated, it is not possible to preprogram the tuning system at the factory to select a particular channel in response to the selection of a network's name.

Efforts have been made by manufacturers to relate channel numbers to network names. For example, it is known from GRUNDIG television receiver CUC-2400 to display on the television screen a station identification label (previously entered by the user) whenever a channel is selected. However, the user must still somehow remember which channel is assigned to which network, because channel selection in this system is by channel number.

Thus, it is desirable that television manufacturers provide remote control handunits which allow viewers to select the channels by name.

A tune-by-label system is known from U.S. Pat. No. 4,706,121 (Young). However, Young provides no means by which the user can enter labels of his own choosing, either for display or for selecting a channel. In Young, the labels are provided by a broadcaster, as part of a TV schedule transmitted to an in-home tuner controller. The labels, such as HBO and ESPN, are displayed in a menu for selection by the user. Such a system requires costly and complex circuity. Perhaps, more importantly, it requires the cooperation of broadcasters to dedicate limited spectrum space to the transmission of schedule information.

SUMMARY OF THE INVENTION

According to the present invention, a tuning system is provided which allows a user to enter a text label and associate it with a particular channel to be tuned. Thereafter, a channel to be tuned may be selected by the user by entering its label.

In another embodiment of the invention, a tuner controller includes a scheduler which allows a user to enter a text label, such as the abbreviation for the name of a television program, to be associated with previously entered programming information. Thereafter, each time the text label is entered, the television program will be automatically scheduled for future recording (in the case of a VCR), or viewing (in the case of a television set).

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a block diagram of the tuning portion of a television receiver suitable for implementing the invention.

FIG. **2** is an illustration of the keyboard of a remote control handunit suitable for implementing the invention.

FIGS. **3***a*–**3***e* are illustrations of display screens generated by the circuitry of FIG. **1**.

FIG. **4** is a flowchart of a program for use with the circuitry of FIG. **1**, for implementing the invention.

FIGS. **5***a* and **5***b* illustrates a memory arrangement produced by implementation of the flowchart of FIG. **4**.

FIG. **6** illustrates in detail a portion of the flowchart of FIG. **4**.

FIG. **7** illustrates in detail another portion of the flowchart of FIG. **4**.

FIGS. **8***a*–**8***d* are illustrations of display screens generated by the circuitry of FIG. **1**.

DETAILED DESCRIPTION OF THE DRAWING

Referring to FIG. **1**, a television receiver includes an antenna **100** which receives radio frequency (RF) sig-

nals and applies them to a tuner assembly **102**. Tuner assembly **102** selects and amplifies a particular RF signal under control of a tuner controller **104** which provides bandswitching signals and tuning voltage signals to tuner assembly **102**.

Tuner assembly **102** converts the received RF signal to an intermediate frequency (IF) signal and provides an IF output signal to IF amplifier and detector **108**. IF amplifier and detector **108** amplifies the IF signal applied to its input terminal and detects the video information contained therein. This detected video information is applied as one input to a video signal switch **109**, the other input of which is coupled to a baseband video input terminal **111** to which an external source of video such as a VCR may be connected. Video signal switch **109** has a control input C for receiving a switching control signal. The output terminal of video switch **109** is coupled to one in-put of a video signal processor unit **122**, the other input of which is connected to an on-screen display circuit **124**. IF amplifier and detector **108** also detects an audio signal for processing in an audio channel (not shown).

Tuner controller **104** generates the before-mentioned tuning voltage signals and bandswitching signals in response to control signals applied from a system control microcomputer (μC) **110**. Microcomputer **110** also generates the switching control signal for video signal switch **109**. The terms "microcomputer" and "microprocessor" as used herein are equivalent. Microcomputer **110** receives user-initiated commands from an infrared (IR) receiver **116** and from a keyboard **118** mounted on the television receiver itself. Microcomputer **110** includes a timer **112**, a program memory (ROM) (not shown) and a random access memory (RAM) **120** for storing channel-related data and scheduler information, such as, times and channels for future television programs. RAM **120** may be of either the volatile or non-volatile type. One skilled in the art will recognize that if volatile memory is utilized that it may be desirable to use a suitable form of standby power to preserve its contents when the receiver is turned off. The television receiver described thusfar is known, for example, from the RCA CTC-140 color television receiver chassis manufactured by Thomson Consumer Electronics, Inc., Indianapolis, Ind. The subject invention will now be described in detail.

IR receiver **116** receives IR signals transmitted by, for example, a remote control handunit **128** having a keyboard such as the one shown in FIG. **2** designated **200**. Keyboard **200** may include keys **202** for entering the digits 0–9, keys **203** for entering channel up and channel down commands and a key **204** for turning the receiver on and off. Remote control keyboard **200** may also include a section labelled TEXT having a key **206** (labelled ON) and a key **208** (labelled ENTER), the operation of which will be described below. Each of the keys in the top three rows, and five keys of the fourth row have a subscript indicating a second function for its respective key. Pressing TEXT ON key **206** enables these keys to be used for entering characters of the alphabet, punctuation marks, a space character, and a backspace command. The first function of each of these keys (TRK−, TRK+, etc.) which is not directly relevant to the subject invention, will not be discussed. Remote control handunit **128** includes therein electronic circuitry (not shown) for encoding a signal to be transmitted in accordance with the particular keys pressed.

Operation of the apparatus illustrated in FIGS. **1**, and **2**, and the display screens illustrated in FIGS. **3***a*–**3***e* will now be described with reference to FIG. **4**. The subject invention makes use of the text programming capabilities already present in, for example, the RCA CTC-140 television receiver referred to above. FIG. **3***a* illustrates a STATUS display screen which is displayed by the CTC-140 television receiver in response to IR signal transmitted when a user presses a STATUS key, such as STATUS key **210** of remote control keyboard **200**. The STATUS display provides information as to time-of-day, station tuned, whether or not a "sleep feature" has been enabled, and which of two antenna connectors (ANT B) have been selected for coupling RF signals to the tuner. FIG. **3***b* illustrates a STATUS display screen modified in accordance with the present invention to display a label (in this case the station call letters WTHN) immediately below the channel number. The label (WTHN) associated with the channel number (13) is entered ("keyed-in") by a user as will be described below. Of course, the label does not have to represent the station call letters but rather could be any alphanumeric label comprising any of one to four characters representing letters, numbers, or punctuation marks. Thus, a user can enter any convenient label which would aid him or her in selecting a desired channel.

The CHANNEL MEMORY display of FIG. **3***c* is used for entering channel numbers and associated labels into memory. The CHANNEL MEMORY SCREEN (FIG. **3***c*) is displayed in response to the activation of MENU SETUP key **212** of remote control unit keyboard **200**. In the illustration of FIG. **3***c* channel 13 has already had a label WTHR stored for display. The legend 'TEXT ON' TO SET ID at the bottom of the display is an instruction to the user that, if he desires, he may press TEXT ON key **206** of remote control unit keyboard **200** to enter a text entry mode for adding a label to the CHANNEL MEMORY display for a particular channel, or for changing a label previously entered. Pressing TEXT ON key **206** causes the generation of the display of FIG. **3***d*.

The dash (—) in the first character position of the label in FIG. **3***d* is a prompt character which serves as a cursor to indicate the label position that will be filled by the next character to be entered. The display of the dash may also alternate with a character from a previously entered label (in this case W) to draw even more attention to the character position to be filled. The legend "xx CHANNEL ID'S LEFT" of FIG. **3***d*, where xx is actually a number, indicates to the user the amount of space remaining in label memory.

The relevant portion of the keycode decoding routine for microcomputer **110** is illustrated in FIG. **4**, and is entered at step **400** from other portions of the keycode decoding routine. The received keycode is examined to see if it is the TEXT ON code sent in response to the pressing of key **206** of remote control keyboard **200** (step **405**). If so, a check is made (step **410**) as to whether channel information is currently being stored in memory **120** (i.e. is a CHANNEL MEMORY screen being displayed?). If channel numbers are currently being stored, the program causes the display of a label programming text entry screen (step **415**) as illustrated in FIG. **3***d*.

If, however, a label is not in the process of being stored, it is assumed that the text is being entered for the purpose of tuning a new channel, and a tune-by-label

text entry screen is displayed (step **420**) on the display screen as illustrated in FIG. **3***e*, and the routine exited.

The next keycode received should be a text character which therefore will cause the program to take the NO path from decision diamond **405** to decision diamond **425** wherein a check is made to see if the received keycode is a text character. If the keycode does correspond to a text character, a decision is made as to whether the program is in a text entry mode (step **430**). If not, an error message is displayed on the display screen (step **435**) and the program is exited normally. If the program is in a text entry mode (step **430**), the new character is appended to the current label being keyed in (step **440**) (or becomes the first character of a new label).

If, on the other hand, the received keycode did not correspond to a text character (step **425**), then the NO path will be followed to decision diamond **445**. In decision diamond **445**, it is determined if the keycode corresponds to the TEXT ENTER key **208**. If not, the current routine is exited by way of the decoding routines for non-alphabetical keycodes (step **450**). If the TEXT ENTER key is decoded (step **445**), then a check is made to see if the TUNE-BY-LABEL screen is displayed (step **455**). If so, the program recognizes that the user has finished entering the label, and it begins a search to see if that label exists in memory **120** (step **460**). If the label does not exist in memory **120**, a "LABEL NOT FOUND" error message is displayed (step **465**). If the label is found in step **460**, then the channel corresponding to this label is tuned (step **470**).

Returning to step **455**, if the TUNE-BY-LABEL screen (FIG. **3***d*) is not currently being displayed, then a check is made (step **475**) to see if the LABEL PROGRAMMING screen is displayed (FIG. **3***c*). If not, then a suitable error message is displayed (step **480**). If, however, the LABEL PROGRAMMING screen were displayed (step **475**), then a check is made to see if the current channel being labelled already has a label associated with it (step **485**). If so, the old label is erased (step **490**), the new label stored (step **495**), and the routine is exited (step **49B**). If the channel had no label (step **485**), then the program advances directly to step **495** for storing the new label.

In a tune-by-label tuning system such as the one described above, a search of memory for a match with a particular label is an additional step, not required in a "tune by channel number" system, which will increase the overall tuning time when changing channels. That is, in order to ensure that a keyed-in label matches a stored label, a four character comparison between the two must be made. Thereafter, the label must be converted to data either representing the channel number, the oscillator frequency or the magnitude of the tuning voltage.

It is recognized herein that the user-entered label data may be stored randomly, for example, in the sequence in which it is entered, or ordered and stored in some logical sequence. If the data were to be stored randomly in the label memory area, and if the searches were to begin at the start of the label memory area and progress from label-to-label, then the duration of the search will vary undesirably with the position of a particular label in the memory. That is, if the label searched for is found in the first location examined, then the search is terminated in the shortest possible time. On the other hand, if the label searched for is found in the last of the label storage locations, then the search will be terminated in the longest possible time.

Viewers have become accustomed to tuning systems which operate relatively quickly with little, or no discernible difference in speed of tuning between different channel numbers. Therefore, it is desirable to minimize the time required to locate a label in memory, so that the overall tuning time is not unnecessarily increased. This becomes more important as the number of stored labels increases.

It is herein recognized that the programming of labels associated with desired channels occurs relatively infrequently, while a search incident to a channel change occurs with much greater frequency. In view of the above, it is herein recognized that it is acceptable to decrease speed of programming in order to increase label search speed during a channel change.

Accordingly, as shown in FIGS. **5***a* and **5***b*, the program portion for the entry of labels produces a memory arrangement wherein labels are arranged alphabetically, and wherein each label is right-justified to facilitate retrieval searches for channel selection. It is noted that a three character label, for example, ABC may be entered by a user as "13*ABC*" or "*ABC*13". *Both of the above labels will be right-justified and stored as "13ABC". This prevents user confusion as to the location of the space character, and additionally serves to physically locate the displayed label more toward the right-hand area of the display screen, so as to lessen interference with the picture being displayed. The labels may be from one to four characters in length. Four character labels are stored in higher memory (i.e. farther from the start of memory) than are three character labels, and so on. Referring to FIG. 5a,* thirteen labels and their associated channel numbers are stored in alphabetical order in a memory **500** in locations **501–513** respectively. A three character label recently entered, is shown stored in a "holding" memory location **520** in preparation for storage. In FIG. **5***b* newly-entered label KYW has been properly stored in memory location **510**. Note that the leading space is also an ASCII text character (20 Hexadecimal (HEX), or 32 decimal), and so exhibits a value which can be used for comparison. Therefore, while a viewer may consider KYW to be a three character label, in fact, the program treats it as a four character label, by evaluating and comparing the ASCII value of the leading space.

The search is performed much more quickly when the labels are stored in alphabetical order than when randomly stored, because once the labels have been arranged in an order, a binary search can be performed. The term "binary search" as used herein means a search in which the label memory area is divided into two parts, one part being rejected on the basis of a comparison with the label being searched. This process is repeated on the accepted part of label memory until the desired label is found. A binary search will be explained by example with respect to FIGS. **5***a* and **5***b*, below.

As noted above, the short search duration described above comes at the expense of a longer time being required for storage. Referring again to FIGS. **5***a* and **5***b*, and to the flowchart of FIG. **6**, note that each of the labels stored in locations **510–513** of FIG. **5***a* has been read and rewritten to locations **511–514**, respectively, in order to create room to store the new label in location **510**. The flowchart of FIG. **6** illustrates in detail program block **495** (STORE NEW LABEL) of the flowchart of FIG. **4**. This portion of the program is entered at step **600**. Comparison location B holds the received keycode and corresponds to holding location **520** of FIG. **5***a*. Microcomputer **110** keeps a record of the number of labels entered by a user. In step **610**, the maximum necessary range of LABEL memory to be

searched is defined by storing the number of labels entered (i.e. the highest location that need be examined) in a memory location designated UL (upper limit), and storing the number 1 (i.e. the lowest label memory location) in a memory location designated LL (lower limit). If UL is not equal to LL (step **615**), then the search has not yet converged, and the NO path is taken to step **620**, wherein the current center position of label memory **500** is determined by taking the integer portion of the average of the upper and lower limits (i.e. the integer portion of (UL+LL)/2). The current center label in memory is read into a location A (step **625**), the contents of which will be compared to the contents of holding location B on a character-by-character basis in steps **630–645**. In each of steps **630–645**, if the label in memory has a lower ASCII value than the newly entered label, the A<B path is taken to step **655**. In step **655**, the current center value +1 is stored in the lower limit memory location (LL). This has the effect of dividing the label memory area in half by discarding all locations at or below the current center value. The program then loops back to step **615** to see if it has converged, and if not, computes a new center value in step **620**. If in step **630–645** a determination is made that the user-entered value is less than the center value in memory, then the center value −1 is stored in the upper limit memory location (UL) (step **660**). This has the effect of dividing the remaining memory in half by discarding all locations at or above the current center value. The program continues in this manner until it finds the label, or until it converges to a condition wherein UL=LL at which point all labels at or above the last upper limit location (i.e. the current value in UL) are moved up (farther from the start) one label location (step **665**). This creates space in the proper location in memory to insert the new label (step **670**), such that the contents of the label memory will be in ascending alphabetical order. Note that even if the newly entered label were found to exactly match a label already stored in memory (i.e. the A=B path were followed in all of steps **630–645**), the program advances to step **665**, creates space in label memory and stores it (although the duplicate label will have a different channel number associated with it). The first of the duplicate labels which is encountered during a binary search will be the one which is tuned. This feature was provided because in some areas of the country viewers can receive the same programming via the same network on two different channels. Thus, the user can assign the same label to each channel.

The label insertion shown in FIGS. **5***a* and **5***b* required twenty read operations of memory **500** and twenty write operations to memory **500** (i.e. one read operation and one store operation per character and channel number) to clear a label memory location, plus five store operations to store the new label and channel number (i.e. the space character must also be stored in memory). It is recognized that when there are many labels to be stored, and when non-volatile memory such as EEPROM (electrically erasable programmable read only memory) is used (which typically has long memory-write times), the storage time may be several seconds. As noted above, however, the label storage process is relatively seldom exercised compared to the number of times the retrieval process is exercised, and therefore the delay in storing a label is an acceptable compromise to ensure fast search time during tuning.

FIG. **7** illustrates in detail the contents of decision diamond **460** of FIG. **4**. This portion of the control program is the binary search algorithm used during the tune-by-label process. Steps **700–760** perform in the same manner as similarly numbered steps in FIG. **6**, and their function will not be described again. There are two exits from this routine, **750** which corresponds to the YES path of decision diamond **460** (i.e. a matching label is found in memory), and **775** which corresponds to the NO path from decision diamond **460** (label not found). As noted above, if the label is found, the tuning data associated therewith is read from memory and used in tuning the desired channel.

Although in the illustrated embodiment, it is assumed that text characters are encoded as ASCII (American Standard Code for Information Interchange) characters, one skilled in the art will recognize that there are other codes which will also perform satisfactorily.

It is further noted that modern television monitor/-receivers include baseband video and audio connectors for connecting signals from, for example, a VCR. Terminal **111** of FIG. **1** is such a video connector, the audio connector is not shown. It is considered within the scope of this invention to allow selection by label for these external connectors. For example, a pair of video in and audio in connectors may be assigned the label VCR1, TAPE, or any other label which is convenient for the user. Upon receiving the baseband selection label controller **110** would cause the selection of the baseband signals in the manner known, for example, from the CTC-140 television receiver mentioned above.

The subject invention may also be useful for scheduling television programs for automatic selection at a future date (for example, timer recording on a VCR). In accordance with this aspect of the invention, in a scheduler mode of operation, a channel will be tuned at a previously programmed time in response to the entering of a label, rather than being immediately tuned in response to the entering of a label. In this embodiment, the labels are associated with television programs (i.e. a particular channel at a particular time), rather than with channel numbers alone.

It is known from prior VCR's, such as the RCA VPT 595 sold by Thomson Consumer Electronics, Inc., Indianapolis, Indiana, to store program recording information which will be maintained rather than erased after recording of the television program so that it might be accessed automatically on a daily or weekly basis. It is noted, however, that there are favorite television programs which may not be programmed for recording in either the "daily" or "weekly" mode, because the viewer normally watches them without recording them. Nevertheless, occasions can, and do arise in which it is desired to record one of these television programs. The user thus may be forced to once again enter the same programming data, each time he or she wants to record a particular television program, because programming data stored in the so-called NORMAL mode (i.e. other than "daily" or "weekly" modes) is usually erased after the recording event.

Operation of the apparatus illustrated in FIGS. **1**, and **2**, and the display screens illustrated in FIGS. **8***a* and **8***b* will now be described. This aspect of the subject invention makes use of the on-screen programming capabilities already present in, for example, the RCA VPT 595 videocassette recorder referred to above.

The scheduler comprises tuner assembly **102**, television tuner controller **104**, microcomputer **110**, timer **112**

and memory **120**. The following is a brief explanation of the scheduling of a particular television program. FIG. **8***a* illustrates a display screen generated by on-screen display circuit **124** in response to he pressing of the PROGRAM (PROG) key **214** of keyboard **200** of remote control unit **128**. The user is instructed to select a number from **1** to **6** corresponding to a desired function. If the user presses key **1**, a CLOCK SET mode is entered. If the user presses key **2**, a NORMAL PROGRAM mode is entered wherein the user may instruct the VCR to record a single program on a date up to a year away. Pressing key **3** causes the scheduling program to enter a DAILY PROGRAM mode wherein the VCR can be instructed to record a program at the same time each day, Monday through Friday. Pressing key **4** causes the scheduling program to enter a WEEKLY PROGRAM mode in which the VCR can be instructed to record a program on a certain day of every week. Pressing key number **5** while the display screen of FIG. **8***a* is displayed causes the display of the LABEL PROGRAM screen illustrated in FIG. **8***b*. Pressing key **6** causes a ten second long display of the information entered for each of the program numbers beginning with the lowest program number (program numbers will be explained below) and displaying information entered for each of the next higher program numbers until all program information has been displayed. In the case illustrated in FIG. **8***b*, all of the data for LABEL PROGRAM **1** has already been entered. Note that in addition to the time data and channel number data, START DAY (rather than START DATE) and LABEL data are displayed.

With respect to START DAY, the following is noted. It is recognized that most television programs broadcast in "prime time" (evenings from 7:00 p.m.–11:00 p.m.) are scheduled to be broadcast once a week, on the same day at the same time. That is, the day on which a television program is broadcast is more important to the user, in this context, than is the numerical date. The label LA which has been entered by a user will be associated with a television program occurring on the day, time, and channel specified in the PROGRAM **1** display screen. As noted above, labels can be any series of alphanumeric characters (limited only by memory size) which is convenient for the user to remember. In practice, a label comprising up to four alphanumeric characters has been found to be sufficient for providing meaningful labels for a user.

Having entered his or her desired label, the user may quickly select the corresponding television program for recording, by simply pressing, for example, the following sequence of keys located on the VCR or on remote control unit **128**: PROGRAM key **214**, TEXT ON key **206**, L key **216**, A key **218**, and TEXT ENTER key **208**. Controller **110** will perform a binary search on the LABEL PROGRAM memory area until it finds label LA. Upon finding the proper label, controller **110** will access the appropriate stored programming data for use in recording the desired television program at the proper time.

Thus, once a label, and its corresponding day, time, and channel information have been stored in the LABEL MEMORY area of memory **120**, a viewer may program the VCR to record the next occurrence of that program simply by entering its label. As noted above, this relieves the viewer from having to reenter the day, time, and channel information each time the viewer wishes to record that program. When newly entered label is found to exactly match a label already stored in memory, then the scheduling information relating to that label is read, and the VCR enabled to record the program at the proper time as determined by timer **112**.

A further useful feature which is possible with a program-by-label system is illustrated in FIGS. **8***c* and **8***d*. The menu of FIG. **8***c* has had a seventh function choice, VACATION PROGRAM, added to it at position **6**, and the PROGRAM REVIEW feature has been relocated to position **7**. If, when the display of FIG. **8***c* is displayed, a keycode of **6** is received, then the program enters the VACATION PROGRAM mode, and the display of FIG. **8***d* is generated. In the display of FIG. **8***d*, all of the label data for six television programs are shown already entered by a user. Each of the labels entered must have previously been associated with television program data by being stored via the LABEL PROGRAMMING mode. If the labels have been previously stored, then in response to, for example, the following sequence of keystrokes: PROGRAM, TEXT ON, "V", "A", "C", TEXT ENTER, microcomputer **110** will access memory **120**, search all labels found in the VACATION memory area and schedule the recording of the respective television programs in accordance with the corresponding data located in the LABEL memory area of memory **120**. In this way a few preferred television programs from all those television program entries having labels associated therewith are easily selected for recording while the user is away.

In another embodiment of the invention, multiple VACATION mode screens may also be provided with each screen having its own label associated therewith. In such an embodiment, a user would be able to select a particular group of television program from a number of such groups, for programming by entering a single label.

It is also recognized herein that television program data may be recalled from LABEL memory by using the program number (e.g. the number 1 of PROGRAM 1), because the numeral 1 is itself a label. However, such a system would require the user to remember which television programs are stored in which numbered program storage area. It is noted that, if desired, such a program-by-number system is easily implemented by use of the present invention by merely using the program number (e.g. 1) as the label.

While the embodiment discussed above concerned recording television programs with a videocassette recorder, it is also recognized herein that scheduler functions are sometimes desirable in other television receiver systems, such as those having display units (commonly referred to as television sets), and in so-called home entertainment centers in which information for an AM/FM radio unit may be displayed on a television screen, such as the RCA Dimensia system. The term television receiver as used herein includes both VCR's and television sets because both of those devices receive and process television signals.

What is claimed:

1. A signal selection system, comprising:

an RF input terminal for receiving a plurality of RF signals;

tuning means coupled to said RF input terminal for selecting a particular RF signal from said plurality of RF signals in response to a tuner control signal;

means, coupled to said tuning means, for detecting said RF signal to produce a detected baseband video signal;

a baseband input terminal for receiving a second baseband video signal;

selection means having first and second input terminals for receiving said detected baseband video signal and said second baseband signal, respectively, said selection means selecting one of said baseband video signals at said first and second input terminals in response to a selection signal;

memory means for storing label data representative of labels comprising at least one alphabetical character, and tuning data associated with respective ones of said RF signals for tuning said RF signals, wherein one of said labels is associated with said baseband input terminal for selecting said baseband signal;

data entry means for generating said label data and said tuning data under user control; and

control means coupled to said data entry means and said memory means for storing said label data and said tuning data in said memory means during a programming mode, said control means also being coupled to said selection means, said control means retrieving said data from said memory means and generating said selection control signal for selecting one of said baseband video signals in response to label data input by a user.

2. The signal selection system of claim 1 wherein said control means is a microcomputer.

3. The signal selection system of claim 2 further comprising on-screen display means for generating signals suitable for displaying said labels.

4. The signal selection system of claim 3 wherein said labels are displayed on a display screen of a television receiver.

5. A signal selection system, comprising:

selection means having first and second input terminals for receiving first and second signals, respectively, said selection means selecting a particular signal from said first and second signals in response to a selection signal, wherein one of said first and second terminals is a baseband input terminal for receiving a baseband video signal;

memory means for storing label data representative of labels comprising at least one alphabetical character, wherein one of said labels is associated with said baseband input terminal for selecting said baseband signal;

data entry means for generating said label data under user control; and

control means coupled to said data entry means and said memory means for evaluating said label data and for storing said label data is said memory means during a programming mode, said control means also being coupled to said selection means, said control means retrieving said data from said memory means and generating said selection control signal for selecting one of said first and second signals in response to label data input by a user.

6. The signal selection system of claim 5 wherein said control means is a microcomputer.

7. The signal selection system of claim 6 further comprising on-screen display means for generating signals suitable for displaying said labels.

8. The signal selection system of claim 7 wherein said labels are displayed on a display screen of a television receiver.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,959,720

DATED : September 25, 1990

INVENTOR(S) : David J. Duffield, et al

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page, the following should be inserted under [56] References Cited, U.S. PATENT DOCUMENT:

--4,600,918 7/1986 Belisomi, et al. 340/711--

and under OTHER PUBLICATIONS:

--NEU N968U, pgs. 45 and 46--.

Signed and Sealed this

Fifth Day of May, 1992

Attest:

DOUGLAS B. COMER

Attesting Officer

Acting Commissioner of Patents and Trademarks